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Signature: G J Warwick

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7. Abstract

This document presents the 222-S Laboratory Complex Wastewater Sampling and Analysis Plan. The plan describes sampling methods, location, frequency, analytes and stream sources.

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CERCLA	*Comprehensive Environmental Response Compensation and Liability Act of 1980*
DST	double-shell tank
EPA	U.S. Environmental Protection Agency
HEIS	Hanford Environmental Information System
OSM	Office of Sample Management
PFP	Plutonium Finishing Plant
PUREX	Plutonium Uranium Extraction
QA	quality assurance
RCRA	*Resource Conservation and Recovery Act of 1976*
SAP	Sampling and Analysis Plan
SST	single-shell tank
TOC	total organic carbon
TPA	Tri-Party Agreement
UO_3	Uranium Oxide
WESF	Waste Encapsulation Storage Facility

222-S LABORATORY COMPLEX WASTEWATER TO 216-S-26 CRIB SAMPLING AND ANALYSIS PLAN

1.0 SAMPLING OBJECTIVES

This plan describes the scheme for sampling and analyzing wastewater originating from the 222-S Laboratory Complex. This liquid effluent is sampled and analyzed in order to:

1. Provide data to confirm waste designation (dangerous or non-dangerous) for the 222-S Laboratory wastewater stream.

2. Provide confirmatory data to support development of wastewater treatment projects and groundwater contamination studies.

3. Provide confirmatory data for the Washington Administrative Code (WAC) 173-240 Engineering Reports for Washington State Waste Discharge Permits.

Quality Assurance (QA) objectives for the sampling activities are described in the *Liquid Effluent Sampling Quality Assurance Project Plan*, WHC-SD-WM-QAPP-011 (WHC 1991).

All changes to the Sampling and Analysis Plan (SAP) shall be considered Class III changes according to the *Hanford Federal Facility Agreement and Consent Order* [Tri-Party Agreement (TPA)] (Ecology et al. 1989).

2.0 SITE BACKGROUND

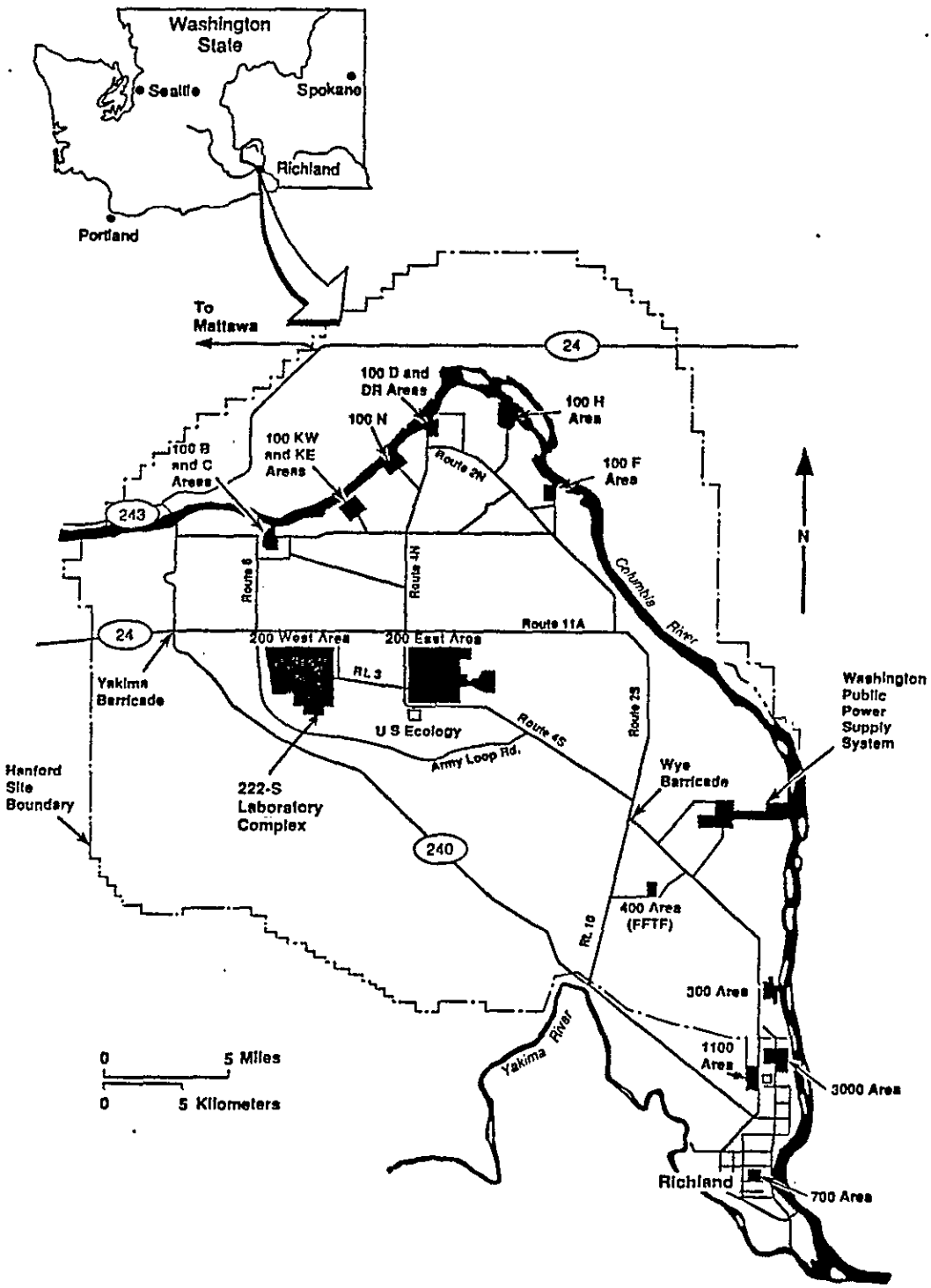
2.1 222-S LABORATORY COMPLEX

The 222-S Laboratory Complex is located in the southeast corner of the 200 West Area within the Hanford Site (Figure 2-1). The 222-S Laboratory Complex consists of the 222-S Laboratory, the 222-SA Standards Laboratory, and several ancillary facilities (Figure 2-2). The main facility of the complex consists of the 222-S Laboratory, which provides analytical support for several activities on the Hanford Site.

The main role for the 222-S Laboratory is to support efforts to characterize the waste stored in the 200 Area's single shell tanks (SST). In addition, analytical services are provided for the following waste-management processing plants:

- Tank Farms
- B Plant
- 242-A Evaporator Facility
- Plutonium-Uranium Extraction (PUREX) Plant

Figure 2-1. Location of the 222-S Laboratory Complex.



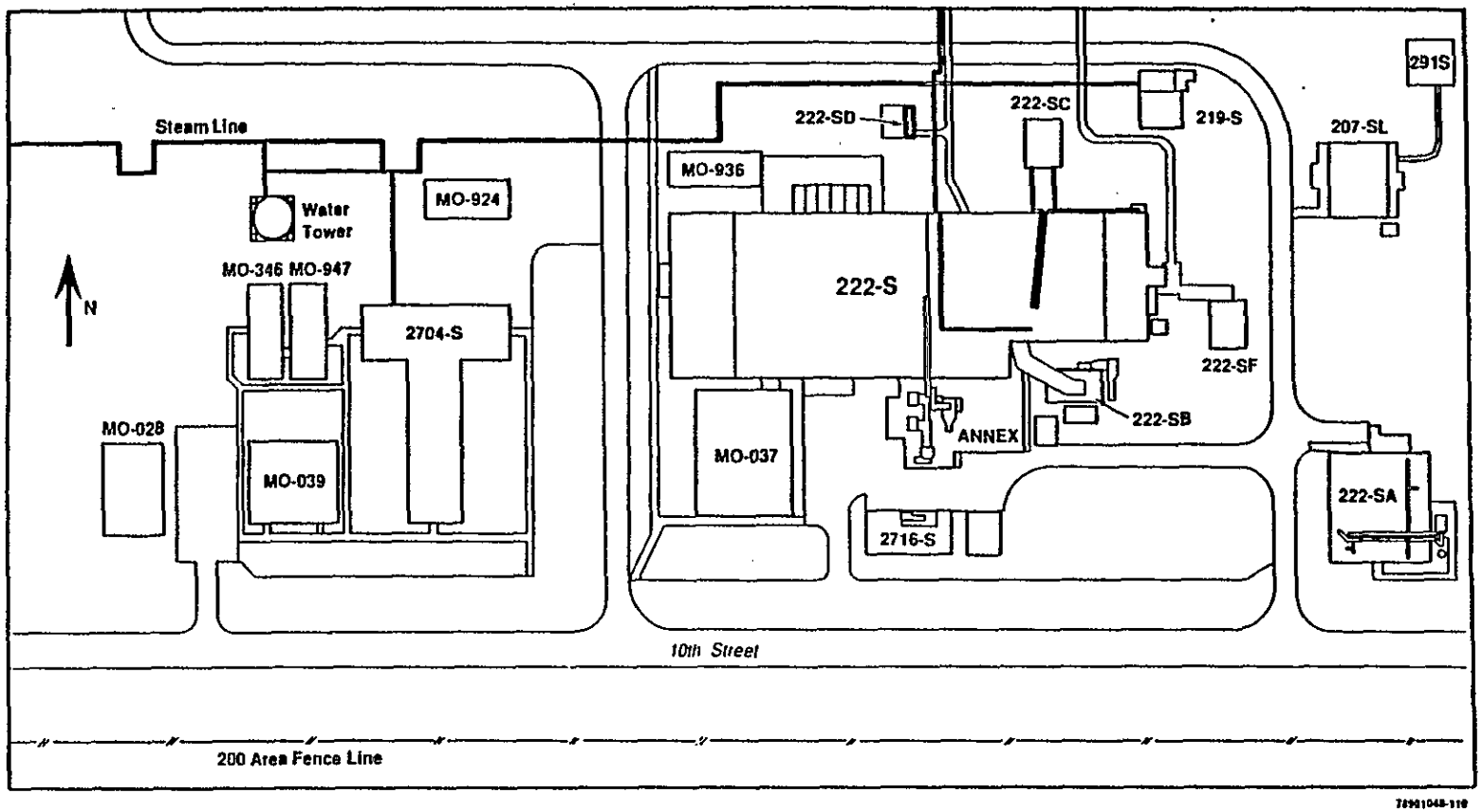


Figure 2-2. 222-S Laboratory and Associated Facilities.

- Plutonium Finishing Plant (PFP)
- Uranium-Oxide (UO_3) Plant
- Waste Encapsulation Storage Facility (WESF)
- Environmental monitoring and surveillance programs
- Activities involving essential materials, research, and development.

At this time, the 222-S Laboratory facilities, equipment, and procedures are being upgraded to support *Resource Conservation and Recovery Act of 1976* (RCRA) analytical protocols and programs for environmental restoration and double-shell tank (DST) characterization.

2.2 222-S LABORATORY

The 222-S Laboratory is housed in a two-story, above-ground building, 322 ft long and 107 ft wide. This structure is divided into laboratory support spaces, office spaces, and supplemental service areas. It has facilities for waste handling and decontamination, and systems for ventilation, radiation monitoring, and fire protection, including alarms.

The first floor of 222-S is divided into three general sections: west, east, and central. The west section, which is kept free of radioactivity and toxic chemicals, contains a lunchroom, offices, and changerooms. The central section contains laboratories and service areas for work with radioactive and/or toxic materials. The east section contains laboratories, hot cells, and service areas for work with radioactive samples.

Radioactive effluents containing hazardous constituents are kept separate from nonradioactive and nonhazardous effluents. Nonradioactive, nonhazardous discharges empty into the 207-SL Retention Basin from the following sources: laboratory sinks, floor drains, service sinks, distilled-water supplies, equipment cooling water, and steam condensate (from nonradioactive and nontoxic areas).

The second floor of 222-S contains the ventilation supply fans, supply and exhaust ducts, the operation and control room for the ventilation system, a glass-blowing shop, and storage areas. This area is a radioactive surface-contamination zone only. Discharges empty into the 207-SL Retention Basin from the following sources: the sinks and drains in the glass-blowing shop; the distilled-water overflow and drain; the backflush and drain from the deionized-water unit and a floor drain near this unit; and flash-tank overflow and drain lines. Lines entering the flash tank carry cooling water from the supply fans, condensate from booster coils, and condensate from the reheat and preheat coils on supply fans.

The basement in 222-S contains tunnel areas with service piping, vacuum pumps, a low-level counting room, an instrument maintenance shop, and a scanning electron microscope laboratory. The only discharge to the 207-SL Basin from the basement area would come from the tunnel sumps which act as floor drains. If the sumps collect any liquid, the liquid is sampled, and if it meets release criteria, it is discharged to the 207-SL Basin.

Effluent from the 222-S Laboratory ordinarily is nonradioactive and nonhazardous. However, there exist radioactive and hazardous constituents within 222-S that because of routine handling possibly can be introduced into discharges directed to the 207-SL Retention Basin.

2.3 207-SL RETENTION BASIN

Wastewater from the 222-S Laboratory is routed to the 207-SL Retention Basin, located directly east of the laboratory facility. Two 25,000-gal below-grade compartments comprise the 207-SL structure. Liquid effluent, potentially contaminated with radioactive and hazardous material, is held in the compartments to allow it to be sampled and analyzed. Effluent is not discharged to the 216-S-26 Crib until it is analytically determined to comply with release criteria established in WHC-CM-7-5 "Environmental Compliance Manual." Batches of held effluent not in compliance with radioactive and mixed-waste release criteria are pumped to the 219-S Waste Handling Facility for transfer to underground storage tanks. Batches of held effluent not in compliance with pH or TOC requirements are handled on a case-by-case basis, in accordance with applicable regulations.

2.4 222-SA STANDARDS LABORATORY

The 222-SA Standards Laboratory is a 5-wide trailer facility, located southeast of the 222-S Laboratory. The 222-SA Standards Laboratory is exempt from radiological control and no radioactive materials are allowed or generated within the building. Nonradioactive standards for other Hanford laboratories are prepared in one of two laboratory sections of 222-SA. The other section is used for research and development. Nonhazardous effluents originating from laboratory sinks, fume hoods, the safety eye wash in the standards laboratory, the glass washer, and vacuum-pumps (cooling water) currently are discharged directly to the 216-S-26 Crib. The wastewater stream from 222-SA is considered nonradioactive and nonhazardous; consequently, it has not been routinely sampled and analyzed. Administrative controls are in place to help prevent discharge of dangerous wastes to this stream. Operating procedures for disposal of liquid wastes to laboratory sinks and drains specifically state that hazardous chemicals may not be disposed of to this stream.

Currently, there is no feasible way to sample the 222-SA effluent stream because it was demonstrated that the potential exists for a *Comprehensive Environmental Response Compensation and Liability Act of 1980* (CERCLA) reportable spill of a hazardous material into the 222-SA wastewater stream. Therefore, this stream will be redirected to the 207-SL Retention Basin. When this is accomplished and the 222-SA stream empties into 207-SL, the stream will mix with effluent from the 222-S Laboratory. Approval to discharge this combined effluent to the 216-S-26 Crib will be contingent on whether samples of the effluent analyzed are in compliance with release criteria.

2.5 291-S STACK FAN HOUSE

The only regular sources of effluent discharged to the 216-S-26 Crib from the 291-S Stack Fan House are cooling water and steam condensate from the emergency fan located there. These small-flow effluents, estimated to be a maximum of 14,000 gal/yr combined, are considered to have no credible potential for bearing radioactive or hazardous-material contamination. Recently a solenoid valve has been installed in the cooling-water supply line to reduce this flow. During warmer periods of the year, the valve is kept closed except when the fan is running. When cooler weather arrives, the valve is left partially open, allowing a small continuous flow to prevent the line from freezing. This modification clearly reduces the annual flow of the 291-S effluent, although the amount of the reduction has not been measured or estimated. Because of its minimal flow, and the fact that there is no credible potential for radioactive or hazardous material contamination of the condensate under routine or upset conditions, this stream will not be sampled.

2.6 219-S WASTE HANDLING FACILITY

Cooling water from Tanks TK-101, TK-102, and TK-103 cooling water jackets, operating gallery Sump No. 8, and steam condensate from the operating gallery all empty into the 207-SL Retention Basin. This stream is non-radioactive and non-hazardous. The discharge from this source is estimated at 1,000 gal/yr.

2.7 216-S-26 CRIB

Under normal conditions, the 216-S-26 Crib receives nonradioactive, nonhazardous effluent from four different sources (Figure 2-3). These sources are: the 222-S Laboratory and the 219-S Waste Handling Facility, by way of the 207-SL Retention Basin; the 222-SA Standards Laboratory; and the 291-S Stack Fan House. Figure 2-4 shows a flow diagram of major sources of wastewater generated within the 222-S Laboratory Complex. Although the potential exists for radioactive and hazardous constituents to be added inadvertently to the effluents from 222-S and 222-SA, administrative procedures, training, and sample analysis greatly limit the possibility of this. Dimensions of the crib are approximately 420 ft x 10 ft, and it is designed to accommodate up to 75,000 gal/d, or 25,000 gal/8-h shift. Flows to the crib average about 1,000 gal/d from 222-SA and 7,000 to 15,000 gal/d from 222-S by way of the 207-SL Retention Basin.

3.0 RESPONSIBILITIES

3.1 SAMPLING TASK LEADER

An environmental engineer from 222-S Engineering Services will be designated as the Sampling Task Leader. In this capacity, the environmental engineer shall establish schedules for the designated facility samplers and the health physics technicians who will participate in the sampling program.

Figure 2-3. 222-S Laboratory Waste Water System.

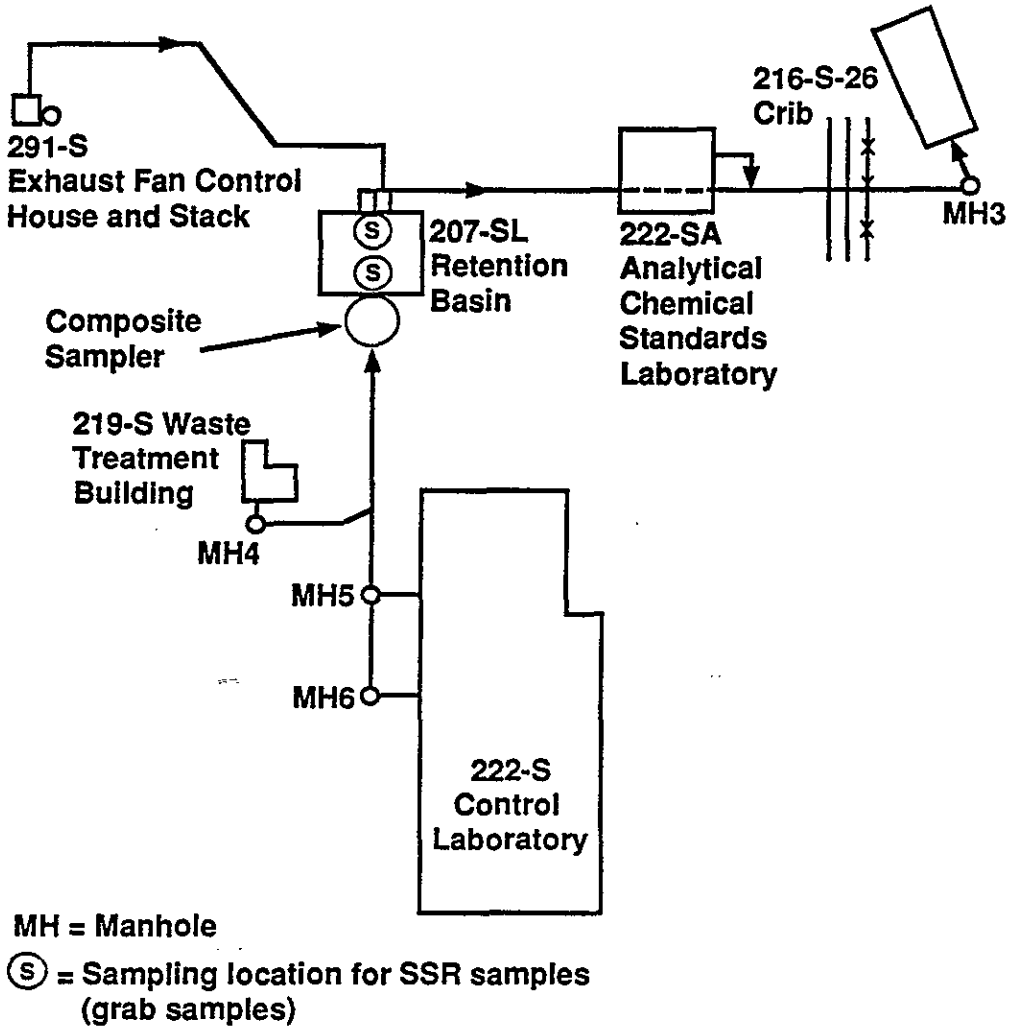
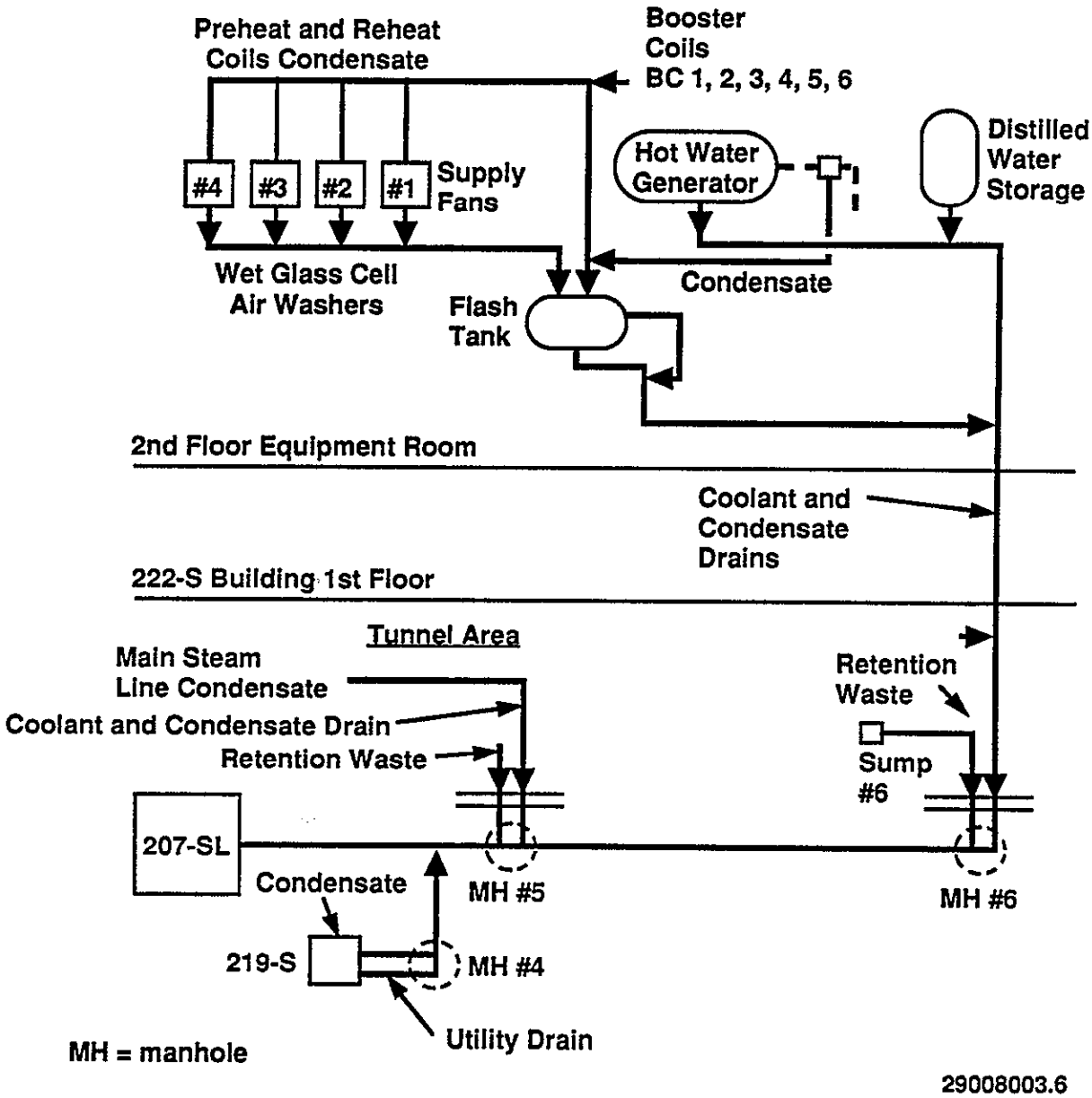


Figure 2-4. 222-S Laboratory Coolant and Condensate Flow Diagram.



The Sampling Task Leader shall prepare a data file on sampling and analysis activities, and maintain it as a quality record. The data file shall include: sampling logs, process flow records, analytical results, relevant calculations, chain of custody records, data validation documentation, copies of the original sampling logs and annual internal reports.

3.2 SAMPLERS

All samples will be collected, using required preservation techniques, by personnel trained to written procedures.

Protocol Samples are to meet the U.S. Environmental Protection Agency (EPA) QA criteria of SW-846. Only the sampling team from Sampling and Mobile Laboratory Unit shall collect Protocol Samples. These personnel are fully qualified CERCLA and RCRA samplers and trained in the security, preservation, and shipping of Protocol Samples. The Protocol sampling shall be coordinated by Engineering Services and the Sampling and Mobile Laboratory Unit.

Chain of Custody protocol shall be followed for both protocol and routing sampling. Copies of completed Chain of Custody records shall be submitted to The Office of Sample Management (OSM) by the sampling teams after each sampling activity and maintained by the original sampler or that persons organization.

3.3 Engineering Services

The 222-S Engineering Services is responsible for preparing Sampling and Analysis Plans and for preparing or revising procedures for sampling activities at the facility. This plan will be controlled using the requirements of WHC-CM-6-1 "Standard Engineering Practices" manual. In addition, this organization will provide technical support to the sampling activities, as needed.

Procedures for normal or routine sampling of 222-S Laboratory Complex discharges to the 216-S-26 Crib shall be prepared by the 222-S Engineering Services Section, tested in the field by designated facility samplers, and reviewed by Nuclear Safety, Environmental Protection, and Quality Assurance. This sampling and related laboratory analysis will require no additional surveillance beyond current procedures.

The 222-S Engineering Services organization shall prepare a data file on sampling and analysis activities and maintain it as a quality record. The data file shall include: sampling logs, process flow records, analytical results, relevant calculations, chain-of-custody records, data validation documentation, copies of the original sampling logs and annual internal reports.

Engineering Services and Environmental Protection will prepare an annual internal report summarizing the validation data.

3.4 OFFICE OF SAMPLE MANAGEMENT

Protocol and routine samples will be analyzed by a laboratory selected by OSM for this purpose. This laboratory must meet the criteria of this SAP and the *Liquid Effluent Sampling Quality Assurance Project Plan*, WHC-SD-WM-QAPP-011 (WHC 1991).

Data validation for Protocol Samples, which will include duplicate results and matrix spike recoveries, will be performed by cognizant OSM personnel in accordance with Section 2.0 of WHC-CM-5-3. OSM will forward the validation results to 222-S Engineering Services.

3.5 QUALITY ASSURANCE

A cognizant member of Quality Assurance who has received training in environmental sampling requirements will observe sampling efforts.

4.0 SAMPLING LOCATION AND FREQUENCY

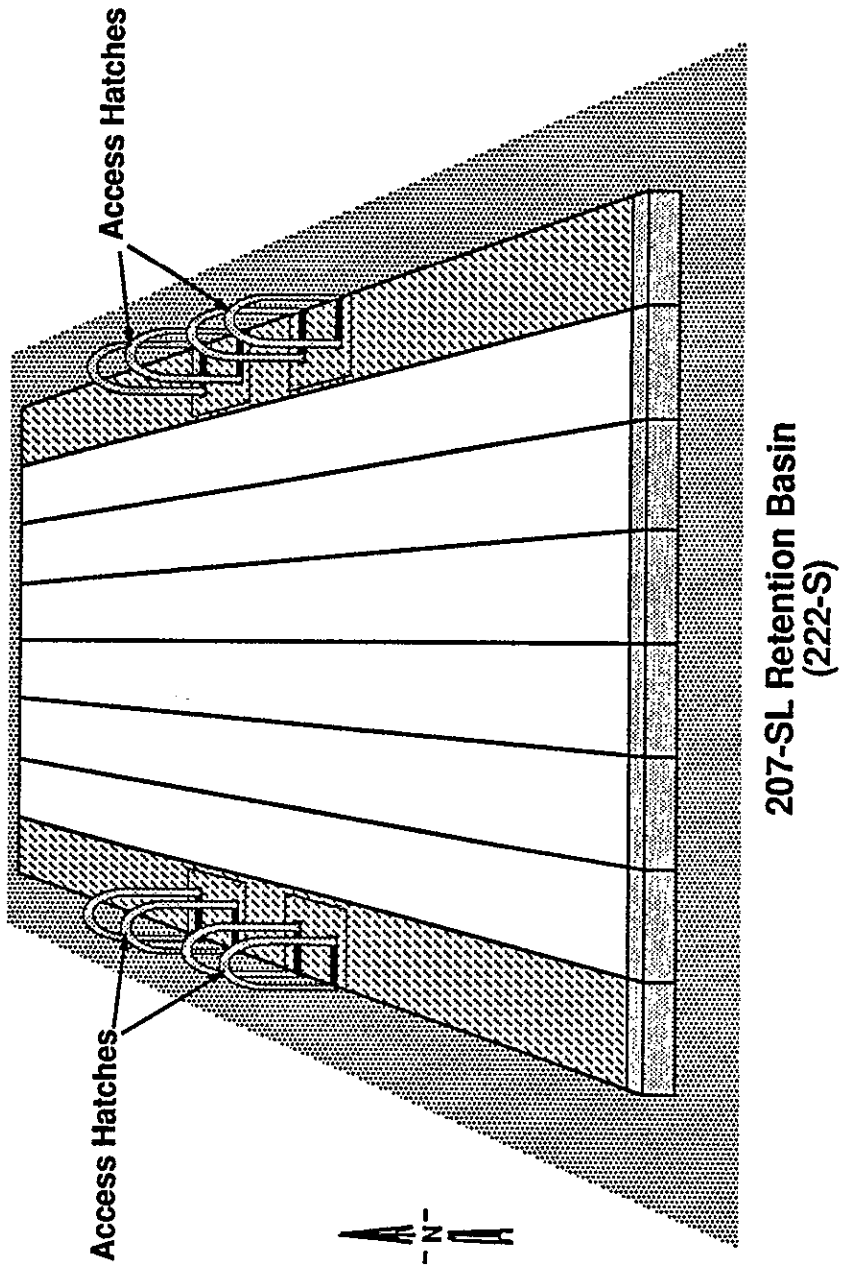
After this plan has been approved, protocol sampling will begin with one sample being taken quarterly for one year. After the data from these samples is compiled the sampling frequency will be reviewed and adjusted accordingly. Taking a protocol sample once every quarter for the first year will provide data from high and low flow time periods. Flow can vary from winter to summer depending on weather conditions and heating or cooling requirements for the facility. Process samples will be collected and analyzed at a frequency compatible with the operational need for releasing batch discharges from the 207-SL Retention Basin to the 216-S-26 Crib. A routine sample will be taken at the same time as the process sample, this will be composited and analyzed monthly.

4.1 PROTOCOL SAMPLING LOCATION AND FREQUENCY

4.1.1 207-SL Retention Basin

At the writing of this plan, protocol sampling of accumulated wastewater in the 207-SL Retention Basin will be done through two sets of hatches in the covering of this facility, as shown in Figure 4-1. These hatches allow direct access to both compartments of the retention basin. Two of the hatches are located on the west end of the basin and the other two are located on the east end of the basin. A sample shall be taken at the west end of the basin, using a weighted bottle-type sampler, with samples being taken of the top third, middle third and bottom third of the basin. These samples will be composited and a subsample sent to the laboratory. This would account for possible stratification and horizontal gradients. In addition, a grab sample shall be taken at the East end of the basin near the discharge point, while the basin is being drained to the 216-S-26 crib. No preventive maintenance will be required for the protocol sampling.

Figure 4-1. 207-SL Retention Basin.



An alternative to the above sampling location and method would be the removal of the concrete blocks which cover the basins. With the removal of these blocks a more representative sampling could occur. This method of sampling would require further planning and budgeting. Areas of concern would be with personnel exposure and safety. If this alternative method of sampling is required a revised sampling schedule would need to be developed.

4.2 ROUTINE SAMPLING LOCATION AND FREQUENCY

At the writing of this plan, routine sampling of accumulated wastewater in the 207-SL Retention Basin is to be done through a hatch in the covering of this facility, as shown in Figure 4-1. A new composite sampling system will be installed at 207-SL. This sampling unit will be used to take composite samples of the wastestream. The samples will be maintained in a refrigerated compartment at 4 ± 2 °C. The frequency of routine sampling will be contingent on the operational need for releasing batch discharges of wastewater from the 207-SL Retention Basin to the 216-S-26 Crib. The composite sampling system will be maintained by the Plant Instrument Surveillance, Calibration, and Evaluation System. This system provides for preventative maintenance of the equipment.

5.0 SAMPLE DESIGNATION

5.1 PROTOCOL SAMPLE LABELING

Sample labels for Protocol Samples shall be furnished by the sampling team from the Sampling and Mobile Laboratory Unit. A sampling team member must record the following information on the labels: the identity of the person in charge of collecting the sample, a unique sample identification number, date and time the sample was collected, type of preservative used (or "none"), the analysis requested, and the location where the sample was collected.

The unique sample number shall be obtained from the Hanford Environmental Information System (HEIS) or equivalent. In addition, each sample container shall be identified with a bar code sticker attached to the container by the container manufacturer. The bar code shall identify the container lot number and individual container number.

Samples also must be labeled to indicate known and potential radiological and chemical hazards.

5.2 ROUTINE SAMPLE LABELING

Currently, grab samples collected from 207-SL are identified and described by this information on sample bottle labels:

- Sample number as follows:
  - S - (four-digit serial number)

  - S = 222-S Plant Designation
  - Serial number = computer generated sequential number
- Date of sample collection
- 207-SL (or 207-SL composite, after composite sampler operational)
- Time of sample collection
- Destination of release: 216-S-26 Crib
- Radiological release sticker.

6.0 SAMPLING EQUIPMENT AND PROCEDURES

6.1 PROTOCOL SAMPLES

The Protocol Sampling procedures shall comply with the recommended practices in SW-846, Chapter 9 in addition to *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7. Surveillance of the sampling shall be by a cognizant member of Quality Assurance who has received training in environmental sampling requirements.

Sample containers shall be new commercially available glass or plastic bottles, certified as pre-cleaned. The sample shall be drawn only with a certified clean equipment. Section 5.5 of the *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7 describes the cleaning process. Sample volumes and numbers of containers are prescribed by the analytical laboratory and are subject to change. Tentative sample volumes for Protocol Samples are given in Table 6-1.

Containers for volatiles, semi-volatiles, and total organic halogens shall be filled without forming bubbles and without leaving a head space.

Preservatives required for Protocol Sampling shall be supplied by vendors and added to the containers in the field. The caps on the containers shall be sealed using tamper-evident tape.

The samples containers shall be cleaned and then surveyed for radioactivity. Upon release, the sample shall be bagged and then re-bagged. The outer bag shall be taped with tamper-evident tape. The samples shall be placed in a cooler containing ice. The cooler shall be become part of the sample packaging. Prior to off-site shipment, the samples shall be screened for radionuclides.

At the time of sampling, the sampling team shall complete its field logs in accordance with the procedure EII 1.5, "Field Logbooks," in the *Environmental Investigations and Site Characterizations Manual*, WHC-CM-7-7. A field logbook shall be maintained that has information pertinent to the sampling, and shall be regarded as a quality-controlled document. The information required by Section 6.0 of WHC-SD-WM-QAPP-011, Rev. 0 shall be recorded in the field notebook.

Table 6-1. Tentative Sample Volumes for Protocol Samples.

Constituent	Recommended container	Preservative	Maximum holding time	Minimum volume for analysis
Radionuclides gross alpha gross beta ^{241}Am $^{239/240}Pu$ ^{137}Cs ^{90}Sr	P, G, T	Acidify to pH <2	6 months	4 mL
Total organic carbon (TOC)	T, G	cool to 4 °C, HCL to pH <2	28 days	250 mL
pH	T, P, G	none	Analyze immediately	125 mL
Nitrate	T, P, G	4 °C, H_2SO_4 to pH <2 none	14 days 48 hours	250 mL
Metals Cadmium Chromium (Total) Lead Mercury Silver	 T, P T, P T, P T, P T, P	adjust pH <2 $\underline{W}HNO_3$	 6 months 6 months 6 months 28 days 6 months	100 mL
Volatile organic compound Carbon Tetrachloride Chloroform Tetrachloroethylene Trichloroethylene Chlorobenzene Pyridine	T, G L	cool to 4 °C, add 0.008% $Na_2S_2O_3$	14 days	2 x 40 mL

P = polyethylene
G = glass
T = teflon
L = teflon lined septum lid.

6.2 ROUTINE SAMPLING EQUIPMENT AND PROCEDURES

Currently a grab sample of accumulated wastewater in the 207-SL Retention Basin currently is collected using a 1-gal stainless-steel bucket lowered on a rope. Two 8-oz polyethylene bottles are then filled from the sample collected. This sampling activity is in accordance with a facility-specific procedure, SO-080-001, Section B, "Collect Sample Using Dip Method."

7.0 SAMPLE HANDLING AND ANALYSIS

7.1 PROTOCOL SAMPLE HANDLING AND ANALYSIS

The handling and preparation of Protocol Samples will comply with the procedures in the *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7. Chain-of-custody for Protocol Samples shall comply with the procedures in EII 5.1, "Chain of Custody," WHC-CM-7-7. A chain-of-custody form shall be used at the time of sampling and will accompany each Protocol Sample. A single sample may be distributed in several containers, and a chain-of-custody form shall account for each container. The preparation of either a single or a group of samples to be shipped to a laboratory shall comply with the procedures in EII 5.11, "Sample Packaging and Shipping," WHC-CM-7-7.

After a Protocol Sample has been collected, it must be in the view or physical control of the current sample custodian, protected to prevent tampering or already sealed with tamper-evident tape. Physical control includes being within the sight of the custodian or locked in a cabinet or in a room equipped with alarms against unauthorized entry. When two or more persons are involved in the sampling effort, one person shall be designated as the sampler and have the only signature authority at this stage of the chain-of-custody. This person remains the custodian until the samples are transferred, and shall sign at the time the samples are released to the next authorized recipient, who then assumes custodianship over the samples.

The approved laboratory contracted to analyze the samples shall designate a sample custodian, and an alternate who is responsible for receiving all samples. At the time of receiving the samples, the sample custodian or the alternate shall sign and date all appropriate receiving documents, including chain-of-custody form and then initiate an internal chain-of-custody form using documented procedures.

Analytical procedures for Protocol Samples shall meet the quality assurance requirements of SW-846. The Statement of Work for completing the analyses shall require the approved laboratory to have existing standard operating procedures. Any changes to these procedures during the term of the laboratory contract shall be submitted to the OSM for approval. Approved laboratory procedures shall describe methods for data reduction, verification, and reporting.

Potential analytes of interest and corresponding analytical reference methods for effluent sampling and monitoring are identified in *Liquid Effluent Sampling Quality Assurance Project Plan*, WHC-SD-WM-QAPP-011 Rev. 0 Appendix A. Procedures used in analyzing these samples shall be equivalent to the referenced analytical methods listed in Appendix A.

Field duplicate samples, split samples, field blanks, trip blanks, and equipment blanks shall be taken during each Protocol Sampling event. A sample of the raw water supply for the 222-S Laboratory Complex shall be collected during each Protocol Sampling event and analyzed for the full set of analytes.

Protocol Samples shall be shipped to a contractor or sub-contractor laboratory approved by Westinghouse Hanford. Analyses performed by this laboratory shall be consistent with SW-846 methods and requirements.

7.2 ROUTINE SAMPLE HANDLING AND ANALYSIS

Routine samples of effluent from the 207-SL Retention Basin are analyzed at the 222-S Laboratory. This wastewater source is known to be nonradioactive and nonhazardous under normal conditions. As soon as the samples are collected, they are delivered to 222-S to await analysis, in accordance with approved sample receiving procedures. The standard requested analytes and corresponding facility-specific procedures are as follows:

- Gross alpha activity, LA-508-113
- Gross beta activity, LA-508-113
- pH, LA-212-102
- TOC, LA-344-105
  (no release criterion exists yet for TOC)
- Nitrate, LA-533-101
  (no release criterion exists yet for nitrate)
- ^{90}Sr, LA-220-104
- ^{137}Cs, LA-548-121
- U total, LA-925-107
- $^{239/240}Pu$, LA-943-123
- ^{241}Am, LA-943-123.

Nonroutine events affecting the composition of the effluent discharging to the 216-S-26 Crib may lead to the need to analyze for constituents not listed. These situations shall be handled on a case-by-case basis.

All analyses performed at the 222-S Laboratory shall be in accordance with approved procedures and conform to applicable quality assurance requirements established in WHC-SD-CP-QAPP-001 current revision. Data sheets produced in conjunction with analyses are quality-controlled documents. Analytical results shall be forwarded to Environmental Protection and 222-S Engineering Services. Any nonconformance items will be documented as described in Section QI 15.1 WHC-CM-4-2 *Quality Assurance Manual*.

8.0 REFERENCES

Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 USC 9601 et seq.

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WAC, 1990, *Submission of Plan and Reports for Construction of Wastewater Facilities*, Washington Administrative Code 173-240, Washington State Department of Ecology.

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WHC, 1989, *Environmental Investigations and Site Characterizations Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Sample Management and Administration*, WHC-CM-5-3, Westinghouse Hanford Company, Richland, Washington.

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INFORMATION RELEASE REQUEST

References: WHC-CM-3-4

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